

IN THE
Supreme Court of the United States

OCTOBER TERM, 1944.

No. 50

THE DOW CHEMICAL COMPANY, A CORPORATION,
Petitioner,

vs.

HALLIBURTON OIL WELL CEMENTING COMPANY,
A CORPORATION,
Respondent.

No. 61

HALLIBURTON OIL WELL CEMENTING COMPANY,
A CORPORATION,
Cross-Petitioner,

vs.

THE DOW CHEMICAL COMPANY, A CORPORATION,
Cross-Respondent.

**REPLY BRIEF ON BEHALF OF THE DOW CHEMICAL
COMPANY.**

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Respondent's brief on invention can be best answered by contrasting our sharply divergent views of the law. Once our difference is understood, the Court will see that much of respondent's brief is superfluous argument of conceded points. Part of it is an erroneous effort to narrow a rule always accepted by this Court, and part of it is a serious distortion of facts relevant on our view of the law.

The Test of Invention.

First, there is only one standard of invention—does the patented thing or process exceed the skill of “an ordinary mechanic acquainted with the business.” That rule was established in *Hotchkiss v. Greenwood*, 11 Howard, 52 U. S. 248, in 1851 and has never been departed from.

Second, in testing a challenged invention by this rule we have two procedures. (1) In cases where, in the face of a recognized need, no satisfactory solution was reached for many years and the challenged invention answers the need, then it is objectively proved that the solution was beyond the skill of the whole industry, and invention is conclusively established. It is on this test that we rely. (2) In most cases, having no objective historical test, we must resort to the test of retrospective simplicity and attempt to measure, by the personal views of the courts, the presumed ability of the “mechanic acquainted with the business”.

In cases of the latter class widespread adoption of the alleged invention is considered only for the purpose of tipping the scales in cases where the court is in doubt as to whether a given change is inventive or only mechanical skill. If it is clear that a change is not inventive, popularity cannot make it so.

But in the former class, when history proves invention, immediate and widespread acceptance has an entirely different probative effect. It is one way (but not the only way) of proving the continued existence of the need and that the challenged invention answered it.

This nice distinction is clearly made in the opinion by Mr. Chief Justice Stone, speaking for this Court in *Paramount v. Tri-Ergon*, 294 U. S. 464, 474-6. This established distinction in the probative value of evidence of widespread adoption disposes of much of respondent's discussion.

Third, when the test of history is applicable, things are proved to be inventive which would generally be held mechanical skill without the evidence provided by the lapse of time. This Court has held this explicitly in the cases pointed out in our main brief, notably the *Barbed Wire Case*, 143 U. S. 275; *Carnegie v. Cambria*, 185 U. S. 403; *Smith v. Snow*, 294 U. S. 1; *Goodyear v. Ray-O-Vac*, 321 U. S. 275; and *Paramount v. Tri-Ergon*, 294 U. S. 464; and the rule has recently been recognized in the concurring opinion of Mr. Chief Justice Stone and Mr. Justice Frankfurter in *Cuno Engineering Co. v. Automatic Devices Co.*, 314 U. S. 84, and in the unanimous opinion of the Court in *Universal Oil Products v. Globe Oil Refining Co.*, 322 U. S. 471.

Now we concede, and always have conceded, that the invention here is such that, judged by the test of retrospective simplicity, anybody would think it should have been made as a natural development of the Frasch process. Much of respondent's brief is devoted to detailed elaboration of evidence leading to this obvious and admitted conclusion.

Respondent's contention that the test of retrospective simplicity must always be used, even in the face of the historical proof of invention, leads to an erroneous conclusion. This simply isn't the law. If it were, we would have no case.

Fourth, respondent erroneously asserts that the "long felt want" test is applicable only in doubtful cases, meaning cases where there would be doubt if the test of retrospective simplicity were used. On the contrary, in the comparatively few cases where the long felt want rule does apply, this Court has held inventive things which appear clearly non-inventive when measured by the test of retrospective simplicity and has clearly expressed, at least in the *Paramount* case and the *Universal Oil* case, its intention

so to do. In part, respondent's error arises from its failure to comprehend the distinction between the two means of measuring invention and in part from its failure to observe the distinction as to the probative effect of evidence so clearly and nicely made in the Paramount case.

That an apparent close analogy between the prior art and the challenged inventions is wholly immaterial in the "long-felt want" cases, is shown by the following from *Carnegie v. Cambria*, 185 U. S. 403, 446:

"We cannot better conclude this opinion than by the following extract from the opinion of Mr. Justice Bradley in *Loom Co. v. Higgins*, 105 U. S. 580, 591: 'But it is plain from the evidence, and from the very fact that it was not sooner adopted and used, that it did not, for years, occur in this light to even the most skillful persons. It may have been under their very eyes, they may almost be said to have stumbled over it; but they certainly failed to see it, to estimate its value, and to bring it into notice. * * * Now that it has succeeded, it may seem very plain to any one that he could have done it as well. This is often the case with inventions of the greatest merit.' "

In *Loom Co. v. Higgins* the invention resulted in an increase in over-all yield of from forty yards of cloth a day to fifty yards, a gain of only twenty-five per cent (105 U. S. 590). This gain justified a finding of invention over art so close as to lead this Court to say the workers in the field "stumbled over it". Here the over-all gain of oil was enormously greater, enough to produce brilliant success where the superficially similar art failed.

The above law points dispose of most of respondent's brief, but some of its discussion is relevant.

Long Felt Want Rule Is Applicable.

Respondent argues that testing a challenged invention by the objective test of history is proper only when it is proved that the failures of the art, which in retrospect seem closest to the challenged invention, were *actually* widely known. This position is contradicted by the facts in the controlling cases, by the language of the decisions, and by the principle underlying them.

So far as concerns the statements by this Court, the language in *Paramount v. Tri-Ergon*, 294 U. S. 464, 474, is sufficiently illustrative:

“Where the method or device satisfies an old and recognized want, invention is to be inferred, rather than the exercise of mechanical skill.”

All this requires is that the *want* shall have been old and known.

See:

Goodyear v. Ray-o-Vac, 321 U. S. 275.

The Barbed Wire Patent, 143 U. S. 275.

Smith v. Snow, 294 U. S. 1.

The case cited by respondent on its erroneous proposition (*Toledo Pressed Steel Co. v. Standard Parts*, 307 U. S. 350, 356) was held not to be a long felt want case. One of the two patent references issued only three years before the patent in suit. The patentee in an effort to show invention offered evidence of the failure of two experimenters to find a solution. This subjective approach was held to be of no importance.

Respondent assumes from the language of the Court that if the witnesses had known of the prior art their testimony might have had some value. This is obviously not the meaning of the decision.

But even if it were the meaning, the facts in the present case show that the oil industry was fully aware of the closest prior art. The producing division of Ohio Oil Company knew all about the Frasch tests. Frasch, Van Dyke, Irish, and Newbauer were all outstanding in the oil industry from 1895 on and all knew of the Frasch work. Several of them were members of the old Standard Oil group. The Frasch tests were given wide publicity throughout the oil industry by the articles in the Oil City Derrick, and in 1912 the Frasch process was again given publicity by the publication in the Journal of Industrial & Engineering Chemistry (Physical Exhibit 365) of an address awarding the Perkin Medal to Frasch as one of the outstanding chemists of that period. Respondent's president, Earle Halliburton, also knew of acidizing and of inhibited acids. (R. 252-254.)

Turning to the facts in the decided cases, at the time of the Barbed Wire invention there was an enormous need for an economical fence which could be erected in the vast unforested areas of the West where common fence materials were not available. Of the great number who felt the need, probably very few realized that cattle would push down a fence of plain wire, but would avoid even a flimsy fence armed with spurs. There was no showing that many knew of the prior efforts to make barbed wire, and that these failed because the barbs were not locked against turning and sliding. The Glidden wire was held inventive because it supplied the need, although it was so simple that this Court said it was strange that the earlier workers had not made it.

Also in the Incubator case (294 U. S. 1) the need was apparent but probably very few knew of the prior futile efforts at staged incubation, or that they failed because of uneven temperatures. Failures generally are not pub-

lished, nor do patents on practically useless, uncommercial things receive wide study. That the matter they contained was available is enough.

A Long Existing Need for Grebe and Sanford Process.

At page 24 of respondent's brief it seeks to account for the failure of the oil industry to adopt the Frasch method by stating that there was little use for such a method at that time. On the contrary, ^{the} number of limestone oil fields in production at Frasch's time was large and the extensive growth thereof prior to the Grebe and Sanford invention was great as shown by the testimony of Fitzgerald (R. 178-180), and graphically presented by the table printed in an appendix to this brief.

Another misstatement on the same page of respondent's brief is that "It is a notorious fact that modern wells are greater producers of oil than in 1896." This statement is wholly unsupported by the record and is not true.

Aggregation.¹

Respondent revives the charge that the Grebe and Sanford process is an aggregation, a charge which was definitely abandoned in the District Court. (R. 1459.)

The trial judge stated that he had considered the question of aggregation and had reached the conclusion that it is not involved in a chemical process, to which respondent's counsel replied (R. 1459):

"Mr. Lyon: * * * I haven't requested any findings

1. Unfortunately, the word "aggregation" is used in two senses in the reported cases. (See opinion of Judge Baker in *Krell Auto Grand Piano Co. v. Story & Clark Co.*, 207 Fed. 946, 951.) In one sense it means that there is no correlation whatever between the elements of the claims, as in *Reckendorfer v. Faber*, 92 U. S. 347. (See also the opinion of Judge McDermott in *Skinner Bros. Belting Co. v. Oil Well Improvements Co.*, 54 F. (2d) 896, 898, which states that a track team is an aggregation and a football team is a combination.) In such cases the claim is void in the absence of any prior art. These cases are very rare.

In the other sense, the term is loosely used to mean a non-inventive combination. When the elements do cooperate, but in an old or obvious

on the aggregation feature, because I think that is too debatable. * * * I have treated my findings, as your Honor will see, on the question of invention, testing it in the orthodox fashion and not asking the court to rule that this is an unpatentable thing because it is a technical aggregation.

"The Court: Then I don't need to spend any time on that."

No Need to Explain Theories or Functions in a Patent.

Respondent repeatedly calls attention to the fact that although Grebe and Sanford describe and claim the use of dilute acid, they do not verbally ascribe to it any special function except the ease with which it can be inhibited.

The statute, R. S. Sec. 4888, does not require any description whatever of functions or of the patentee's reason for doing any particular thing. It only requires in the case of a process that he shall file "a written description of the same and of the manner and process of * * * using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it appertains, or with which it is most nearly connected, to * * * use the same; * * *."

While inventors often do expatiate on the merits and theories of their processes, there is no statute requiring them to do so, and they often do not.

An inventor may in his patent include merely a baldly empirical description of his process with adequate operat-

way, and the courts after applying the test of retrospective simplicity find that invention is lacking, sometimes inaccurately call such a combination an aggregation. What is really meant is an exhausted or unpatentable combination. An invention which fills a long felt want should never be so tested.

In this sense the Grebe & Sanford process is not an aggregation. The dilution of the acid and the inhibitor cooperate to get the acid through the pump tube without hurting the tube and without spending the strength of the acid by harmful action on the tube. The use of the conventional pump tube thus made practicable simplifies the whole operation. The pressure applied to the tube forces the unweakened acid out into the rock. Clearly, the features cooperate.

ing directions, and may then claim whatever inventive novelty the process may contain. In subsequent litigation he may prove and rely on any functions or theories of operation which inhere in the described operation.

So too, if he states one theory in his patent he may rely on others not stated, and even if he states an erroneous theory he may prove and rest on another and correct theory. The only statutory requirement is for a clear description of the process, which always consists of an act or operation, or a number of acts or operations. The public is entitled to this clear description of what to do, and that is indispensable. All discussion of theories is superfluous, its insertion is surplusage, and when erroneous it is simply to be ignored like surplusage in any legal document.

In this Court the following statements establish the rule upon an unassailable basis. In *Eames v. Andrews* (the Driven Well case), 122 U. S. 40, 55-6, this Court said:

“ ‘An inventor may be ignorant of the scientific principle, or he may think he knows it and yet be uncertain, or he may be confident as to what it is, and others may think differently. All this is immaterial, if by the specification the thing to be done is so set forth that it can be reproduced.’ ”

Also in *Diamond Rubber Co. v. Consolidated Tire Co.*, the Grant Tire case (220 U. S. 428, 435-6) this Court said:

“ * * * A patentee may be baldly empirical, seeing nothing beyond his experiments and the result; yet if he has added a new and valuable article to the world's utilities he is entitled to the rank and protection of an inventor. And how can it take from his merit that he may not know all of the forces which he has brought into operation? It is certainly not necessary that he understand or be able to state the scientific principles underlying his invention, and it is immaterial whether he can stand a successful examination as to the speculative ideas involved.”

These principles have been applied in countless cases in the various Courts of Appeals. They have been universally accepted.

Sufficiency of Disclosure.

Respondent somewhat tentatively suggests that the Grebe and Sanford disclosure is inadequate. In the light of the statute and of the cases last cited the only thing they are required to disclose is what to do in practicing the process. Not only do they give a good deal of general description, more than the statute requires, but they give in complete detail the steps of a typical operation. Nobody who reads their patent can be in any doubt about how to proceed in practicing their process, and that is all that is required.

Definition of the Claims.

Respondent criticizes as indefinite the requirement of the claims that the acid shall contain a relatively small proportion of an inhibitor, and cites in support of its position the decision in *General Electric Co. v. Wabash Appliance Co.*, 304 U. S. 364, 371, dealing especially with functional claims. P. 109 respondent's brief.

Respondent omits the part of the opinion which clearly supports the claims here. Immediately after the matter respondent cites this Court said:

"A limited use of terms of effect or result, which accurately define the essential qualities of a product to one skilled in the art, may in some instances be permissible and even desirable, but a characteristic essential to novelty may not be distinguished from the old art solely by its tendency to remedy the problems in the art met by the patent."

And in elucidation of this language the opinion cites in the footnote *Davis v. New Departure*, 217 F. 775, 782.

The theory of the latter case, which this Court evidently

intended to adopt and express, is that general broad terms (including functional terms) may properly be used to describe old, well known elements, but when there is a special element, whose novelty is relied on to establish patentability, that element must be claimed in precise language. An excellent but general example of nice draughtsmanship is found in the claim sustained in the *Paper Bag Patent case*, 210 U. S. 405, 417, where the old parts were functionally described.

Now in the instant case there was nothing new in the inhibitor *per se*. Many inhibitors were known long before Grebe and Sanford used them in their process, and they claim to have discovered nothing new about inhibitors or the amount of each one needed. Inhibitors differ greatly among themselves in the proportion required, but as to each, the art well knew how much to use.² Indeed some inhibitors like "Rodine" were regularly marketed, and their makers naturally gave operating directions. In all cases the inhibitors were used in quite small quantities compared to the acid to which they were added.³

So in referring to the use in their process of one of the common inhibitors Grebe and Sanford very properly used general language adequately descriptive of the already well known art.

Just as in *Davis v. New Departure* the term "brake mechanism" meant any of the brakes adaptable to the construction, so here "a relatively small amount of a corrosion inhibitor" means any of the inhibitors in the always small proportion proper for that particular inhibitor. This use

2. The inhibitive effects of different small amounts of several inhibitors named in the Grebe-Sanford patent are shown in PX-171. (R. 1723.)

3. The Millon article, published in 1845, states (R. 1583): "In some cases the addition of a *small quantity* of copper sulfate has suspended very appreciably the action of hydrochloric acid." The Watts article, published in 1912 (R. 1587), refers to the "remarkable reduction in the corrosion of iron by sulphuric acid, brought about by the addition of a *small amount* of arsenious oxide to the acid." (Emphasis ours.)

of general terms to describe things already known is not only proper, but this Court has specifically approved it.

Frasch Failed to Solve the Want.

The want which confronted the oil industry before Frasch's date and continued up to 1932, was to recover additional oil from limestone wells at a cost substantially less than the value of the extra oil recovered.

Merely getting oil from the ground, without regard to cost, could be accomplished by means known in Frasch's time, as for example by mining, a process used in Europe. In this country such a method is too expensive.

The Court of Appeals for the Sixth Circuit concluded that Frasch was successful merely because some of the wells he treated showed slightly improved yields. That alone is not enough. The additional oil recovered must more than pay for the additional cost and risk involved. In that respect the Frasch process was a failure. Apparently it failed because the additional yield was too small, he had to pull the pump rod and tube and replace it with a special pipe that was only good for about five treatments (R. 1890), and he used expensive concentrated acid which did not work far enough into the formation. The owners of the well complained about the cost of the treatment to the very well which is claimed to have been most benefited. (R. 1897-1899.)

The Frasch Tests.

The Oil City Derrick reports that the Crossley well increased 300%. Respondent (p. 22) says the production, before acidizing was 1.6 barrels which, if true, would mean an increase of only 4.8 barrels per day. On R. 1898 the complete production records of this well are given. It was treated in August 1895, after August 2 (R. 1894, 1907).

The production in July, the month just before acidizing, was 180.01 barrels, or 6 barrels per day. The best month after treatment was October, with 259.49 barrels, or 8.4 barrels per day. There was a gain of but 2.4 barrels, or a 40% increase, and not a 300% increase as stated by the Court of Appeals for the Sixth Circuit.

The Taylor well was flowing 5 barrels per day before treating. After treating (R. 1657) it did not flow at all. It had to be pumped at great expense (R. 1897-99). We do not know what it would have produced if pumped before acidizing but obviously more than the 5 barrels it produced by flowing. The Oil City Derrick (R. 1659) on February 20, 1896 reported that this well had shown an increased production of \$3,500, at a cost of \$300. On February 13, 1896 (R. 1897) the Ohio Oil Company, owner of the well, reported that the production had increased by \$1,200, at a cost of \$1,500. These figures were sent to Van Dyke (R. 1898-9).

A comparison of specific as against general accounts of these two wells indicates that all of the reported production figures were colored or puffed, but whatever may be the fact, the production was insufficient to justify further use of the process even though both Frasch and Van Dyke were then and subsequently in a position to put it into wide use.

We accept respondent's list of tests which, for clarity, we re-arrange in their proper sequential order, adding the name of the proprietor of the wells and showing the initial gain in barrels.

Ex.	R.	Date of Article	Date of Test	Owner	Farm & Well	Production Before Test	Production After Test	Initial Gain
143	{ 1653 1894	10/10/95	About 8/5/95	Ohio Oil Co.	Crossley	6 bbl. ⁹	8.4 bbl. ²	2.4 bbl. loss 5 ⁹
144	1657	11/ 9/95		Ohio Oil Co.	Taylor	5 ⁹	6 ⁹	7 ⁴
145	1658	1/15/96		Ohio Oil Co.	Richard ² Ohio #1	4 ⁹	11 ⁴	6
145	1658	1/15/96		Ohio Oil Co.	Cusack-Ohio #2	4	4	5
145	1658	1/15/96		Scott	Acnett	11	16	8.5
145	1658	1/15/96		Scott	Metz	2.5	11	10
146	1660	2/20/96		Neely	Neely	7	17	12.5
146	1660	2/20/96		Scott	Presser	7.5	20	13.5
148	1662	3/26/96	3/ 4/96	Jones & Ball	O'Connell	6.5	20	43
148	1662	3/26/96	3/10/96	Jones & Ball	Bingham	2	45	12.33
148	1662	3/26/96	1/27/96	Sawyer	Tinsley	1.66	14	3
148	1662	3/26/96	Jan. '96	Scott	Hydecker	3	6	

TOTAL GAIN (omitting Taylor loss) 117.23
AVERAGE FOR 11 TESTS..... 10.68

(R. 1898.) This figure is the average daily production of the well for the month of July 1895. The well was acidized August 5-10 (R. 1894). Respondent gives the pre-acidizing production as 1 barrel based upon a 2½ unsigned paper of unknown origin (R. 1894). The 6 barrel figure is based upon the accurate production records of the company.

(R. 1898.) This is the average daily production of the best month following acidizing. The daily average for the 5 months following the month of acidizing, was only 6½ barrels—an increase of ½ barrel.

This well flowed 5 bbls. before acidizing and none after acidizing. A pump was then installed which removed the pressure from a 1200 foot column of oil, estimated at 450 pounds. The total gain for 3 months after treatment was 1500 barrels. (R. 1897.) Thus the average daily gain by pumping was only 17 barrels instead of 30.

This test is mentioned twice. These are the first figures given. The second mention (Ex. 146, R. 1660) gives 3 bbls. before test and 12 after.

The gains were so low as naturally to lead to abandoning the process. Note again the results for Ohio Oil Company—first test 2.4 bbls. gain; second test apparently harmful, since the well *flowed* 5 bbls. before treatment and would not flow at all after treatment; third test 7 barrels gain; fourth test no gain. Naturally that company had no more tests made. Scott also had four tests made which showed gains of 5, 8.5, 12.5 and 3 bbls.—total 29 bbls.—average 7.25 bbls. Scott surely would want no more treatments.

Frasch got only one substantial increase (the Bingham) and that was in a well which, as pointed out in our main brief, dropped rapidly in production in its first few days of operation, showing it was probably clogged very near the hole and would have responded freely to any well cleaning treatment. (See page 53 of respondent's brief.)

After March 4, 1896 (save for one test in a dry hole in 1897, R. 1663) the process was permanently abandoned and has never been tried since by anybody. This is a record of more abject failure than was assumed from the mere Frasch patent by the Court of Appeals for the Tenth Circuit.

Respondent argues that one operation of Sprenger (R. 1257) was a test of the Frasch process. This is quite erroneous. After a large number of oil wells in the Greendale field near Midland, Michigan, had been treated by the Grebe-Sanford process, Sprenger treated a well in the same field by putting 60 gallons (6 carboys) of concentrated raw acid in the well with a dump bailer, a device which prevents the acid from contacting the tubing. He then washed down the well with water, necessarily diluting the acid as it was in the open hole and not in the well tubing, and pumped eight barrels of oil on top of the acid, holding it there for 24 hours. This operation was far from Frasch's

process and in no way contradicts our statement that the Frasch process has never yet been used since it was abandoned by Frasch and Van Dyke. All later treatments by Sprenger were with 15% dilute raw acid introduced through the tubing, and these treatments resulted in so much damage to the well equipment that Sprenger quit his job with Oil Makers Company and it changed to the use of *inhibited* 15% acid.

Gains From Respondent's Michigan Infringements.

Respondent seeks to minimize the gap between Frasch's futile tests and petitioner's huge success by asserting that the gains in its accused operations, proven as the specific acts of infringement relied on, were so low as to be comparable with Frasch's. The facts are incorrectly stated.

Petitioner relies for acts of infringement upon respondent's treatments of the Weber Oil Company's Wilcox, Zahn and Crawford wells.

Careful computation from production figures given in the record (R. 302-304) for these wells shows that the wells were initially improved as set forth in the following table. The figures given were arrived at by taking the average production for several days before treatment and comparing it with the average daily production after acidizing, excluding the first day after treatment, as it would include the recovery of oil put in the well before the treatment. (In connection with the Crawford well, the production figures were gauged in a 500 barrel tank. This tank gauged 32 barrels per foot, as shown in the original deposition.)

	Before	After	Gain
Wilcox	10	40	30
Zahn	3.4	25.9	22.5
Crawford	6.7	70.3	63.6
Average Gain			38.7 barrels

This is more than three times the Frasch gains, even as reported by the promotor, Van Dyke.

The Mechanism of the Processes.

The fundamental facts are clear. Frasch used large quantities of raw concentrated acid which he introduced quite slowly through a special coated tube, the use of which required pulling and taking apart the pump rod and pump tube, assembling and inserting the special acid tube, pulling and taking apart the latter, and again assembling and running the pump rod and pump tube, a very cumbersome operation.⁴

Petitioner's process differing in the use of dilute acid, adding an inhibitor and using the pump tube already there, is not only vastly simpler in its mechanics, but produces greatly enhanced yields of oil.

We can speculate endlessly about what takes place thousands of feet underground under conditions which cannot be duplicated for laboratory observation, but the inescapable fact is that there are vast differences between the two processes and petitioner's process succeeds while Frasch's failed.

We think the dilute acid is much better. It has at least received the tribute of universal adoption. Respondent theorizes that Frasch's concentrated acid is really better. Respondent's action in using dilute acid in its infringing operations belies this argument.

Respondent argues that Frasch really used dilute acid

4. The pulling of the tubing before some of respondent's treatments, alluded to by respondent (Resp. Br. p. 57), had no apparent relation to the treatments but was evidently to adjust either the packers, already in place, or the pumps to get the wells in good order in anticipation of enhanced yield. It involved only one removal and return of the usual tubing, through which respondent then introduced its acid.

(page 19 of brief). This is quite untrue. Frasch's actual operation is described in detail in the first Oil City Derrick article (R. 1651). In a typical treatment, he used 65 barrels of concentrated raw acid which entered the rock very slowly. His one-inch tube was such that it held only one barrel of acid in a column nearly 1,300 feet long. After about 60 barrels of acid had entered the rock, he would have a small amount of largely spent acid in the bottom of the well hole and about one barrel of concentrated fresh acid in the tube. Then he began to force water into the 1 inch tube, no mixing of acid and water would occur in the tube and no substantial mixing could occur after the water leaves the tube.

The references cited by respondent to show the use of dilute acid by Frasch do not support this allegation. The only "eye" witness was Nichols, a fifteen year old boy at the time. Nichols is never shown to have seen a well treated with hydrochloric acid of any kind. He stated (R. 1034) that he thought the acid was sulfuric and that it was in carboys. Carboys would mean concentrated acid. There is no evidence that the acid was dilute. Irish (R. 1049) and Neubauer (R. 1060) admitted they never saw a well treated with acid. The publications referred to by respondent clearly demonstrate that the acid used was concentrated, and this use is consistent with the teachings of the Frasch patent.

It is obvious that if equal volumes of dilute and concentrated acid are introduced *at the same speed*, the concentrated should work further out from the well hole. But the mechanical difficulties of handling raw concentrated acid are so great that, in the Frasch process, it was introduced very slowly and so could not do what Frasch wanted to do, which was to work far from the hole, for it spends itself very soon.

As to the speed of reaction respondent challenges our statement of fact. In the first place, anybody who has seen acids, especially strong acids like hydrochloric, react with carbonates knows the reaction is violent and rapid. If the carbonates present a large surface that the acid can get at, all at once, the reaction is very quick. When the carbonate is powdered, as in baking powder and effervescent medicinal salts (*e. g.*, Bromo-Seltzer), even a weak acid results in a reaction complete in a minute or two. When the acid is forced through tiny pores so that a vast surface is exposed to its action, the result must be much the same. Acid works slowly on carbonates only when it must eat off the surface a little at a time before it can get at further areas.

Hence, speed of introduction into the formation is desirable for working far from the well, which both Frasch and Grebe and Sanford wanted to do. It is equally clear that Frasch's acid went in very slowly, the treatment of the Crossly well required six days (R. 1894). Certainly in Frasch's time concentrated raw acid could not be pumped at all (see footnote in respondent's brief, (p. 56), so that Frasch had to use only the hydrostatic pressure resulting from the column of acid in his tubing, until nearly all his largely spent acid in the well hole had seeped slowly into the rock before he could follow it up with water under pressure.

Grebe and Sanford, in the specific example given in their patent (R. 1502), charge in 4,500 lbs. (about 500 gallons) of dilute, inhibited acid, all of which, because of its comparatively innocuous character and the capacity of the tube, could be temporarily stored in the ordinary pump tube. They then force in a quantity of crude oil to force unspent acid into the rock and permit it to act on the formation surrounding the well cavity (Cl. 8, Rec. 1503), whereas in

Frasch the acid is largely spent when entering the formation. Grebe and Sanford's dilute acid can be forced in quickly with little expenditure in the well hole "enlarging the pores and channels in the rock, or opening up new channels." (R. 1502.)

Respondent's argument that the acid is in contact with the well tubing for such a short time that an inhibitor is unnecessary is refuted by the evidence (R. 198, 1799), as well as by respondent's continued use of inhibited acid.

Pressure.

Respondent's brief (pp. 58-60) attacks our statement that Grebe and Sanford, rather than Frasch, taught the use of pressure to force a charge of acid into the oil-bearing formation, before substantial ^{neutralization} ~~acidification~~ at the face of the well hole. We granted that Frasch said that pressure should be used, but he showed no means to force an entire charge of his raw concentrated acid into the formation, and we know of no means which was practicable then or now for doing so. Grebe and Sanford, by using inhibited acid, and particularly dilute inhibited acid, made it possible to force the entire charge of largely unneutralized acid into the formation with pumps which were available to Frasch but could not be used with his acid.

Dilute Acid.

Respondent accuses us of changing ground here, and to support its position quotes the colloquy between the Trial Judge and Dr. Bartell, an expert called by us to testify on the factual issue of inhibition of respondent's acid (Br. pp. 4, 15, 16). If the whole discussion be read it is apparent that Judge Tuttle was trying to find out whether the presence of the inhibitor altered the chemical action of the acid

on the rock. We don't think it does and have always so stated. It does permit the acid to be introduced through the conventional pump tubing, and prevents the acid from wasting its strength on the iron and so permits it to do more work on the rock.

But throughout our whole case the continuous argument was that Frasch's process failed profitably to increase the yield of an oil well and was abandoned and forgotten for thirty-six years before Grebe and Sanford succeeded. And in the argument (R. 1443-4) petitioner stressed as the keys to success precisely the same things it urges here, the dilution of the acid, its inhibition, and its introduction through the usual pump tube.

Perhaps all speculation about the underground reaction is improper. In any event the results are clear, and respondent gets them by using the Grebe and Sanford method.

The Injunction in the Williams Bros. Case.

On pages 67 and 95 of its brief, respondent states that in the Williams Bros. suit defendant was enjoined from using inhibited hydrochloric acid upon sandstone formations.

The record citation which respondent gives, namely, page 31 of physical exhibit PX-297, does not support this contention and we know of no evidence in the record which does support it. All that the Williams' record shows is that inquiry was made by interrogatory (Exhibit PX-297, page 18), as to a certain well which turned out to be a well in a substantially insoluble formation and was not relied upon as an infringement. Williams Bros. admitted infringement in acidizing wells in limestone formation and no point was made in the record of the treatment of any sandstone well.

Suggestions by The Pure Oil Company.

The Court of Appeals stated in its opinion:

“All of the elements of the claimed combination were old. It was old to increase production by the use of hydrochloric acid under pressure. The use of this very process was suggested to Grebe & Sanford by the Pure Oil Company, prior to the issuance of the patent in suit, and was not original with them.”

On pages 11 and 69 of respondent's brief, the last of the above quoted sentences is printed in heavy type as a heading, the first two quoted sentences being omitted, giving the erroneous impression that the court found the process of Grebe and Sanford to have been suggested by the Pure Oil Company. Obviously, the Court was merely stating the admitted fact (Finding of Fact 72), that the Pure Oil Company suggested to petitioner the acidizing of oil wells with raw concentrated hydrochloric acid, which suggestion added nothing to the disclosure of the Frasch patent.

Respondent totally misrepresents the relation between the Pure Oil Co. and petitioner, the nature of their dispute and its adjustment. Fairness requires that this situation be understood.

Before the date of their invention, Grebe and Sanford had experimented with putting raw acid in a few of the brine wells in and near Midland which provide petitioner with the brine from which it makes bromine and magnesium. Their object was in part to increase production. (R. 1416-17.) Petitioner also had used inhibited hydrochloric acid to clean calcareous scale out of boilers, and from this and other work Grebe and Sanford knew about the use of inhibitors in hydrochloric acid. (R. 1855.) Neither knew about the Frasch patent, the Frasch tests or had given any thought to the generally known need for increasing oil production.

Thomas of Pure Oil Co. also knew nothing about the Frasch patent, the Frasch tests or about inhibitors (R. 1015). Thomas had a vague idea of using hydrochloric acid to increase oil production, but clearly he had no complete concept of a process, indeed nothing anywhere near as clear as the Frasch patent or the articles describing his tests. With this general idea in mind he visited Grebe and Sanford to inquire about the costs of acid and its availability, told them what he was thinking about and directed their thoughts to the old problem of increasing oil production. Nothing he said to them was anything like as good a disclosure as would have been handing them the Frasch patent, of which they were actually ignorant, but, of course, presumed to know.

On these facts the trial court found (R. 1489):

"The acidizing of oil wells with hydrochloric acid to increase the production of the wells was suggested to the applicants for Letters Patent 1,877,504 by representatives of the Pure Oil Company and was not original with or conceived by such applicants."

This finding is literally true, but nothing at all can be added to it by inference, or evidence. The acidizing of oil wells to increase production was suggested broadly by Thomas, but Grebe and Sanford had previously acidized brine wells with dilute hydrochloric acid with the same object.

Of the three novel points specified in claim 8 all were suggested by Grebe and Sanford. They suggested the use of dilute acid, they suggested the addition of the inhibitor, and they suggested that this innocuous acid could be put down the pump tube without injury.⁵

And when the first test was made, using a well of the

5. Thomas was proposing to deposit the acid in the well by means of a dump baller or to make the test on an old well that they were going to junk anyway. (R. 1016, 1021.)

Pure Oil Co., petitioner made up a charge of dilute inhibited acid and one of its men put it down the pump tube (R. 1795). Sanford was present and assisted in making the treatment (R. 1999). Respondent's statement, on page 71 of its brief, that the records of petitioner do not show that inhibitor was added to the first acid used for Pure, is incorrect. See R. 110, 111, 113, 114, 1591, 1779 and 1793. Thomas was not even present when the first two treatments to Pure's wells were made and could not have known whether or not an inhibitor was used. (R. 1015.)

In making the early tests Carr of Pure Oil devised a method of packing off the well with oil and for this invention he secured a patent. (R. 1988.) Thomas filed no application for patent and he was not requested to do so by Pure Oil Company, although he discussed his ideas with the officers of that company. (R. 1028-30.) Nor did anyone else connected with Pure Oil Company file an application covering an invention similar to that of the patent in suit.

When Pure learned that petitioner had applied for a patent, not knowing just what the application covered or what the art was, it protested, as people often do who have a broad notion and fear that it is being appropriated. There were no interferences declared by the Patent Office. After the Carr and Grebe-Sanford patents issued, a conference straightened the matter out without real controversy and a contract was entered into, dated January 31, 1933. (PX-369, R. 1873.) This was superseded by contract dated June 30, 1934. (PX-370, R. 1877.)

When the parties met, the Frasch patent had become known to both, although the Oil City Derrick articles had not. So it was assumed and agreed by both that Grebe and Sanford had invented those changes over the Frasch patent which they claimed, *i. e.*, the introduction of dilute inhibited acid through the pump tube, and that Carr had

invented the changes which he claimed, *i. e.*, the use of the oil packing system. (R. 1988.)

This brought about a situation very common in dealing with patents. Each had invented something that the other wanted to use. So a trade was made. For its comparatively small use of the process in its own wells Pure got a free license under the Grebe and Sanford patent. Because petitioner hoped to treat wells for the whole trade, and expected to use the Carr packer in this vastly larger number of wells, it agreed to pay Pure five dollars a well for the right to use the Carr packer.

There was absolutely nothing in the settlement in the slightest degree casting any doubt on the originality of Grebe and Sanford's claimed concept. We freely concede that Thomas led Grebe and Sanford to think about the oil problem, but that is all he did. Every feature of their claimed novelty over Frasch was their own idea.

Thomas himself says that dilute inhibited acid was suggested by Grebe and Sanford at their first interview. (R. 1016, 1018, 1030.) The use of dilute acid is shown in the formula worked out by Grebe's assistant and handed to Thomas at the first interview. (R. 1012, 1993.)

The Gypsy Operations.

Most of what is said by respondent about the Gypsy operations is answered in our main brief.

We repeat that Gypsy used concentrated acid, and it had a very good reason for so doing. It had heavy deposits of scale inside its pump tubes, and it wanted to dissolve as much as it could with the volume of acid that would fill the tube. At times it used acid outside the tube also. Even concentrated acid dissolves only about one-fifth of its volume of calcium carbonate, and to get a large amount of scale into solution the acid should be as strong as possible.

One witness (R. 1066) referred to the acid in one test as dilute, but this must have been an error because all the calculations as to the amount of acid needed and to be used were based on 20° Baume (31.45%) acid. (R. 1677.) Besides, the acid was in carboys, and this usually means fresh, concentrated acid as shipped by the makers. The witness undoubtedly meant each 10-gallon carboy of concentrated acid was "diluted" with one quart of inhibitor solution. The witness Kiser refers to the acid as being "diluted" with Rodine (R. 1076), and this meaning of the word "dilute" is the only one consistent with the testimony about carboys and the calculations as to how much limestone the acid would eat. (R. 1074, 1677, 1922.)

However, one outstanding point about these tests is that they were abandoned and in total disuse for about two years before the Grebe and Sanford invention, and respondent's explanations are futile in the face of the admitted fact that during that time Gypsy was trying other expedients for removing scale and made no attempt to treat the producing formation of any of its limestone wells.

The other vital point is that these tests do not anticipate the Grebe and Sanford invention. They were performed for a different purpose and taught nobody to practice the patented process during the nearly five years which elapsed between Gypsy's first attempt to remove scale from sandstone wells and the time it employed petitioner's licensee to acidize the first of its limestone wells ever to be treated.

The Operations of the Oil Makers Co.

Little need be added to what is in our main brief. This evidence was produced by us to show the extensive injury to equipment caused by the use of *dilute raw acid*. It clearly does prove that there was damage sufficient to

make the whole value of the operations very dubious and to force the Oil Makers Company to adopt directly infringing operations with inhibited acid.

Sprenger testified that there was known, substantial damage by the raw hydrochloric acid to at least seven of the twenty-five wells that he treated while employed by Oil Makers (R. 1259-71):

"I talked with my associates and told them that I was quitting. I told them that I believed that the business was too big for us. We were causing more damage than we were making money to pay for. I told them that unless we found some way to use the acid without causing so much trouble to the steel material in the well, that it was useless to continue" (R. 1271).

Respondent's discussion does not fairly separate the early operation with dilute raw acid from the later one using dilute inhibited acid.

Operations of Chemical Process Co.

The statement in our main brief that the use of raw acid by this company is supported by the evidence of only one biased witness is challenged in a most surprising fashion. In a foot-note (Res. Br. p. 84) respondent quotes Dr. Knappen to the effect that he understood this company (Chemical Process) did not use an inhibitor after the filing of the Williams Bros. suit. This evidence is not only formally incompetent, but Knappen's immediately following statement shows it is valueless.

He said (R. 1092): "The other company I have reference to is the Halliburton Oil Well Cementing Company (respondent) who have treated wells for us and, so far as I am advised, have not used inhibited acid."

His evidence is no better as to the acid of one company than the other. Both lower courts, after a careful review

of the facts, found that respondent's acid is inhibited. And since lead sheets were found in the tanks of the Chemical Process Company it doubtless inhibits its acid in the same surreptitious way.

Infringement.

On this branch of the case the facts found below should not be disturbed since there is no conflict between Circuits. It should be assumed that the lower courts' finding that respondent's present process infringes is correct. (Finding 84, R. 1490.)⁶

Respondent argues (pp. 104, 105) that Grebe and Sanford are limited to an inhibitor which will not attack metal surfaces. Respondent implies that copper and lead chlorides, as used by it, do attack metal surfaces. Arsenic is Grebe and Sanford's preferred inhibitor.

The mechanism of the inhibited action of arsenic is identical with that of lead and copper. The arsenic is introduced as arsenic oxide and promptly forms arsenic chloride (R. 1941). The lead, copper and arsenic chlorides all inhibit the action of hydrochloric acid on iron by plating out on the iron surface to replace dissolved iron removed by the acid. Protection is thus secured by replacement of a thin layer of iron, perhaps only one atom thick, by a corresponding layer of metallic arsenic or lead or copper, as the case may be.

6. It was admitted at the trial that respondent used inhibited 15% hydrochloric acid in infringing acidizing treatments during 1935 and until the Grebe and Sanford patent in suit was sustained in the *Williams Bros.* case in January, 1936. (R. 254, 256, 257, 259 and 260.) In view of this admission, the question of infringement by respondent's present process becomes of secondary importance, being in fact merely one of venue.

Respondent (a Delaware corporation) is licensed to do business in Michigan. This court held in *Neirbo v. Bethlehem Shipbuilding Co.*, 308 U. S. 165, that such a license waived the residence requirements for venue under Judicial Code 51. If this Court intended this same waiver to apply to the residence requirements of Sec. 48 governing venue of patent suits, then venue is not an issue, and infringement by respondent's present process need not be investigated.

As to the mechanism there is no doubt. Rebbeck says (R. 1346):

“• • • in order to work arsenic has to plate out and in order to plate out iron has to dissolve, and if iron dissolves, it is dissolving, it is not remaining inert or unattacked.”

To the same effect is the article by Oliver P. Watts (R. 1587):

“Iron dissolves and by so doing deposits arsenic upon the surface of the iron. Since the arsenic is deposited simultaneously with the dissolving of the iron, and only as a result of this dissolving, • • •”

Many other metallic salts (including copper and lead chlorides) plate out in the same way, taking the place of the iron which dissolves, and this is precisely what occurs in respondent's process held to infringe.

Respondent further urges that the patent in suit should be limited to non-metallic inhibitors because of an alleged “disclaimer” of all metallic chlorides, whereas the inescapable fact is that the preferred inhibitor of the patent is a small amount of a compound of the metal, arsenic, which when added to hydrochloric acid is at once acted on by the acid to form chloride of arsenic. This use of the term “disclaimer” by respondent is grossly misleading. Actually no disclaimer of any kind was filed, and rightly considered the argument is merely that of file wrapper estoppel, based on a statement made by the patent solicitor during prosecution of the application.

To understand what the solicitor meant, we must discuss a little elementary chemistry.

In most chemically active aqueous solutions the dissolved material is largely ionized, *i. e.*, it splits into two parts, one of which carries a positive and the other a negative electric charge.

When common salt (NaCl) is dissolved in water the salt is largely ionized into positively charged sodium (Na) ions and negatively charged chloride (Cl) ions. Similarly, in a solution of arsenic chloride (AsCl_3) the dissolved material is largely ionized into positively charged arsenic (As) ions and negatively charged chloride ions. It is the arsenic ions in the latter solution which act to inhibit the action of hydrochloric acid on metals such as iron. The chloride ions have no inhibiting effect. Similarly they have no inhibiting effect in a solution of sodium chloride. No chloride ion, whether formed by the ionization of a metallic chloride or otherwise, will act as an inhibitor.

It is the negative chloride ions normally appearing in the well in conjunction with the well water thereof, *i. e.*, the alkaline well solutions, that were under discussion in the Patent Office and not the positively charged metallic ions, which were claimed and allowed as the effective inhibitor.

The file wrapper shows that this was clearly the meaning of the statement of the attorney (R. 2036) and was so understood by the Examiner in subsequently allowing the claims.

When arsenic in any of the usual compounds is put into hydrochloric acid we get chloride of arsenic, a metallic chloride (see Beneker patent R. 1941), which ionizes at once so that the solution contains positively charged arsenic ions. These are what do the work. And when copper and lead salts are present in small quantities as they are in respondent's process, they too ionize so that we have positively charged copper and lead ions which do the work.

The acid used by respondent contains small amounts of copper and lead, which both the lower courts found to inhibit the acid as required by the patent in suit.

Respondent's acid was inhibited on the average about

52% (R. 1705). (The Court of Appeals found it to be 40-60% (R. 2054). This is squarely within the range of inhibition of various inhibitors set forth in the Grebe and Sanford patent. The chart in the appendix, p. 35 shows graphically the comparative results secured by various inhibitors named in the patent and respondent's inhibitors. As the chart shows, and as the Court of Appeals found: "There is no substantial difference between the results secured by the respondent and that secured by petitioner, and the method used is essentially the same" (R. 2054).

In view of the above the only question on infringement is one of fact—do the lead and copper in respondent's treating acid act as inhibitors? Both courts below answered that question in the affirmative, and under settled practice here that question is not open.

The Tenth Circuit Opinion.

In arguing the Williams Brothers case we stated, as we do here, that invention by Grebe and Sanford depended upon the application of the "long-felt want" rule and could not be supported by the more commonly applied test which this Court has recently and correctly called the uncertain test of "retrospective simplicity". The Tenth Circuit Court of Appeals accepted the "long-felt want" test as the proper measuring rule and therefore correctly rejected all varieties of argument applicable to the rejected rule.

Most of respondent's criticism of the opinion is that the Court refused to consider these inapplicable arguments, such as that, both Frasch and the use of inhibitors being old and well-known, any skilled man should have seen that they could be combined. But for thirty-six years neither the skilled men nor the experts in the industry saw that this combination should be made. Hence all such arguments become irrelevant.

The Court of Appeals for the Tenth Circuit held Frasch was a failure. The present record makes a still better case for patentability of Grebe and Sanford over Frasch for it shows twelve actual Frasch tests which received wide publicity, uncommercially low yields in these tests, and thirty-six years during which the whole industry made no effort to acidize limestone wells, or to use the Frasch process or anything like it.

The Court of Appeals for the Tenth Circuit correctly held the Gypsy work was abandoned and that it would not have anticipated if fully established as prior art. It was dropped completely. The explanation now given, that oil was cheap, etc., is completely answered by the fact that Gypsy was still trying, by other means, to remove scale. Furthermore, Gypsy's work on scale removal didn't teach Gypsy to acidize wells to increase production. That work was done for it by petitioner's licensee under the patent in suit and after thus learning of the efficiency of the Grebe and Sanford process Gypsy proceeded promptly and extensively to use it (R-1088, 1090, 1104). The quotation from Knappen (Respondent's Brief, pp. 68, 69) is incomplete and its use is misleading. Knappen said, "The reason that Gypsy employed Dowell, Incorporated, to treat certain of their wells was that at that time we did not have our acid treating equipment in shape to do the work;" (R. 1089).

Naturally they didn't. The idea of acidizing with considerable volume of dilute acid forced out into the formation was new to Gypsy and it had no tanks or acid handling devices of any kind on hand. In its early, abandoned work on scale removal Gypsy used concentrated acid, received as usual from the maker in ten gallon glass carboys, and poured the acid from these carboys, ten gallons at a time, down the wells.

Treatments by the Grebe-Sanford process require suitable equipment for making up considerable charges of inhibited dilute acid and getting it to the well and down the pump tube. The whole idea was new to Gypsy, and while it could easily have obtained the proper equipment, it did not have it or need it for its scale-removal tests.

The Court of Appeals for the Tenth Circuit rejected the Gypsy tests as an anticipation on clearly correct grounds, and having rejected the test of retrospective simplicity it refused to consider this work as an element of art to be added to the Frasch art. In short, under the precedent established by this Court it refused altogether to consider how close the art seems in retrospect, so long as the great problem remained unsolved.

With its view of the apposite rule of law the Court of Appeals for the Tenth Circuit would have decided the present case as it did the Williams case. In the long-felt want cases nothing short of a complete anticipation which answers the want should defeat a patent.

Respectfully submitted,

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APPENDIX.

INFRINGEMENT.

Reduction in Corrosiveness.

Comparison of the Effect of Respondent's Inhibitors and Those Named in Grebe and Sanford Patent.

